

**Clinton Lake
1999 Water Quality Report**

1. General.

- a. **Project location.** Clinton Dam is located approximately 4 miles southwest of Lawrence, Kansas, at river mile 22.2 of the Wakarusa River, a right bank tributary of the Kansas River. The project watershed encompasses 367 square miles.
- b. **Authorized project purposes.** Flood control, water supply, and low flow supplementation are the primary project purposes; equally important, however, are its fish and wildlife resources and recreation benefits.
- c. **Pertinent data.**

Pools	Surface Elevation (ft. above m.s.l.)	Current Capacity (1,000 A.F.)	Surface Area (acres)	Shoreline (miles)
Flood Control	903.5	270.1	12,891	
Multipurpose	875.5	125.3	7,006	85
Inactive		26.4*		
Total		395.4		

Total Drainage Area: 367.0 sq. miles

Average Annual Inflow: 176,863 acre-feet

* Contained in multipurpose pool.

2. Activities and studies of the year.

Monthly herbicide and nutrient sampling was conducted by lake project personnel, with technical and analytical support from PM-PR-W, April-September 1999 at one inflow station, three lake stations (two depths), and the outlet. Nutrient samples were shipped to the Chemical and Materials Quality Assurance Laboratory (CMQAL) in Omaha for analysis while the herbicide samples were shipped to the PM-PR-W laboratory for analysis of four of the most commonly occurring herbicides by the ELISA (enzyme linked immunosorbent assay) method. Ten percent of the herbicide samples were shipped to the CMQAL to be analyzed by Gas Chromatography (GC) for quality control purposes. All generated data were entered in excel spreadsheets as an interim to the EPA national water quality data management system, NEW STORET, which is still in the developmental stage. Table 1 at the end of this report includes all

the available nutrient and herbicide data for the past years from 1996-1999.

The OF-CL is to be commended for its continued support of water quality monitoring of Clinton Lake and its tributaries. The OF-CL personnel deserving special recognition include Messrs. David Rhoades, Kipp Walters, Jim Franz, and Victor Counts.

3. Existing conditions.

a. **Inflow.** During the monthly sampling of the Wakarusa River (station CL-

16), total nitrogen concentrations ($\text{NH}_3 + \text{NO}_3 + \text{NO}_2 + \text{TKN}$) averaged 1.72 mg/L, which was well above eutrophic levels ($>1 \text{ mg/L}$).

Figure 1 shows the trend for total nitrogen concentrations over the past three years. As can be seen from this graph, levels have typically been above eutrophic levels with spikes occurring during high inflows such as in April 1999.

The total phosphorus average concentration at 0.37 mg/L was also above the Environmental

FIGURE 1

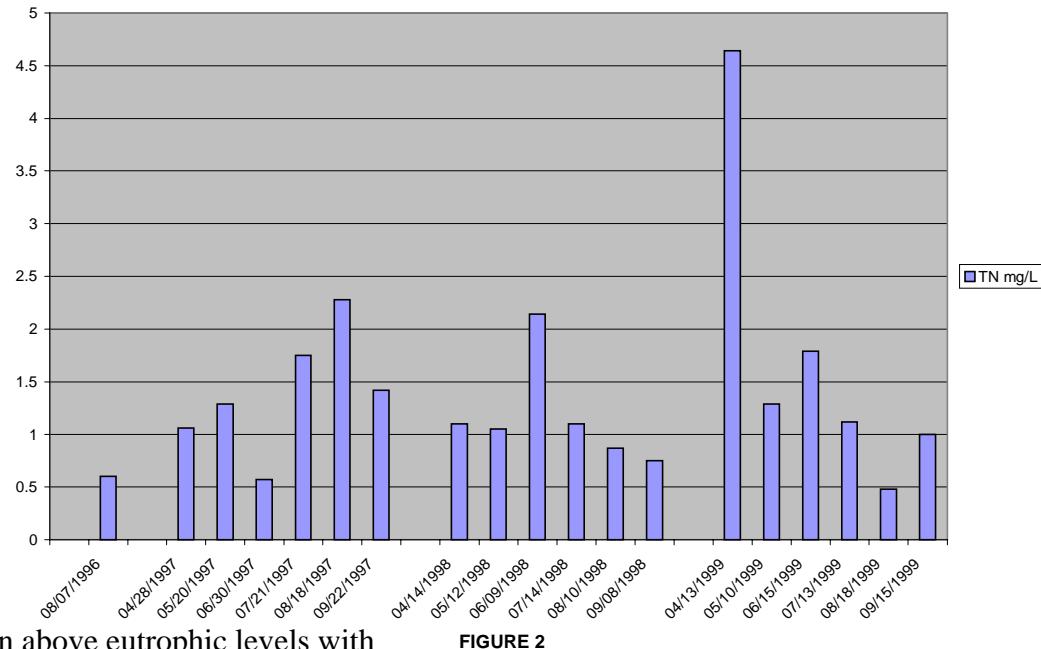
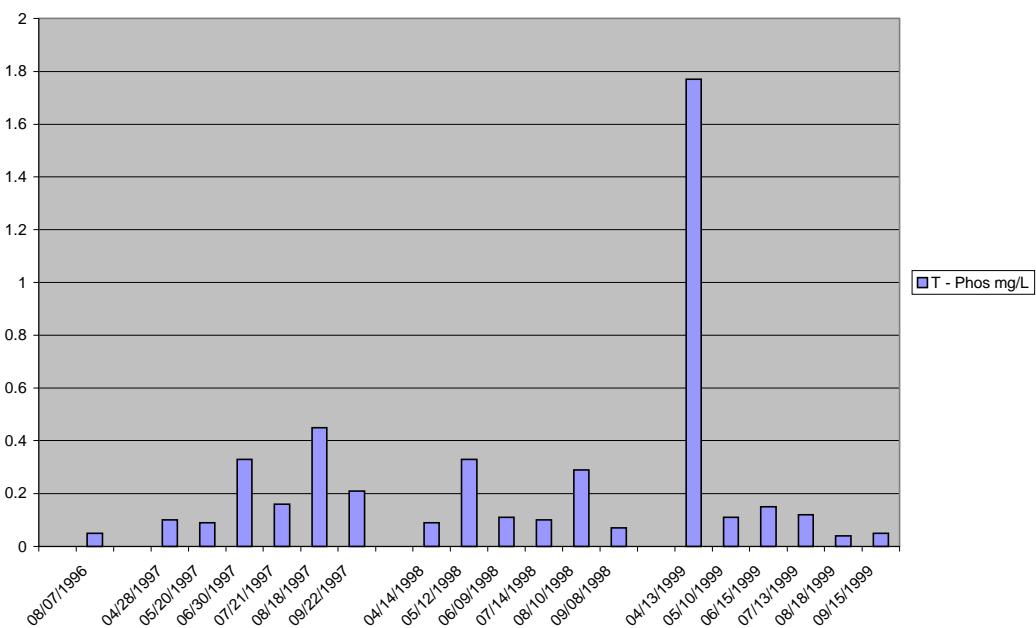


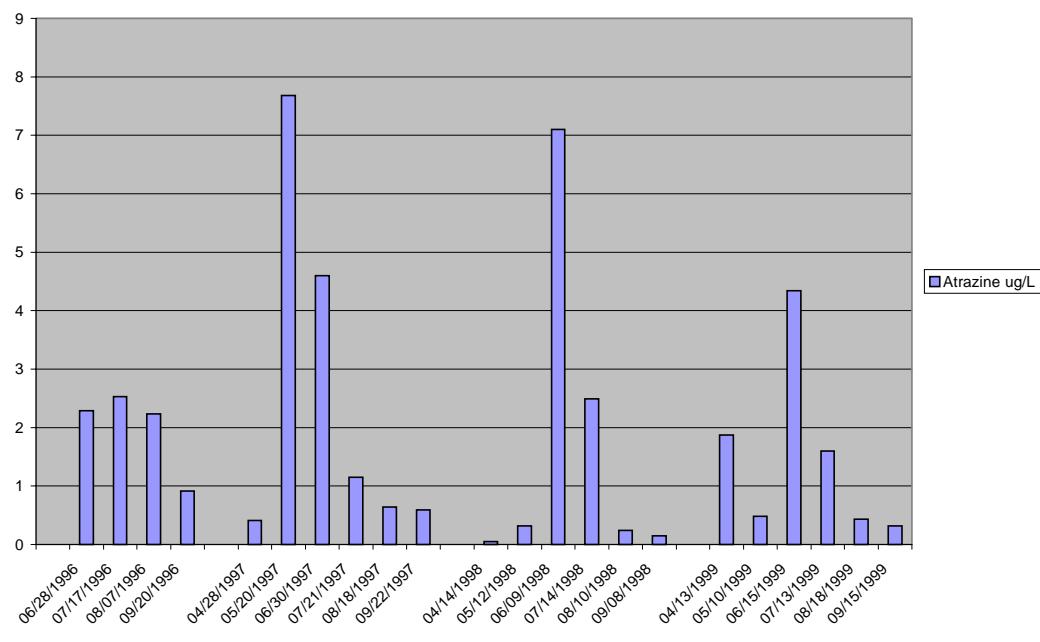
FIGURE 2



Protection Agency (EPA) suggested stream criterion of 0.1 mg/L for the protection of aquatic ecosystems in 1999. The trend for the last three years shows levels close to or above the 0.1 mg/L stream criterion (Figure 2).

FIGURE 3

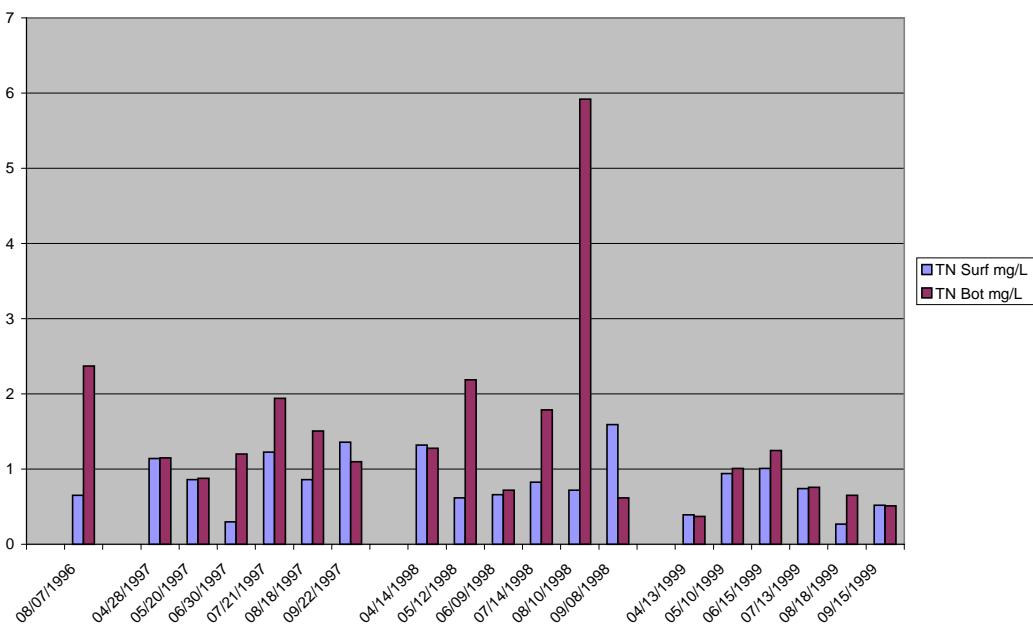
Within the six-month sampling period atrazine, metolachlor, alachlor, and cyanazine were detected. Atrazine averaged 1.51 ug/L with a high concentration of 4.34 ug/L. The June runoff concentrations



were well above the EPA maximum contaminant level (MCL) standard for drinking water supplies of 3 ug/L. The trend for the past four years is shown in Figure 3. Alachlor and cyanazine averaged 0.67 ug/L and 0.15 ug/L, respectively. These concentrations were well below the EPA standard for drinking water of 2 ug/L for alachlor and 1 ug/L for cyanazine. No standard has been established for metolachlor, which had a mean concentration in the stream of 0.60 ug/L.

FIGURE 4: CL-2

b. Lake.
Stations CL-2, CL-6, and CL-12 were sampled during the six-month sampling period from mid April-September. Mean total nitrogen concentrations in the surface waters were 0.65 mg/L, 1.05 mg/L, and



0.90 mg/L, respectively. Mean total nitrogen concentrations in the bottom waters were 0.76 mg/L, 1.38 mg/L, and 1.07 mg/L, respectively. Figures 4, 5, and 6 show the relationship between the total nitrogen concentrations of these three lake stations over the past three years. As can be seen

from these three graphs, concentrations at bottom depths are equal to or greater than those at the surface. The high spikes can be attributed to high inflows and temperature differences between surface and bottom waters. Concentrations throughout the lake appear to be fairly uniform. (Note: Figure 6 has an unusually high concentration which appeared in June 1998.)

Total phosphorus concentrations contributed to the eutrophic nature of the lake, also, with means in the surface waters of 0.05 mg/L, 0.13 mg/L, and 0.11 mg/L, respectively. Mean TP concentrations in the bottom waters differed at

0.08 mg/L, 0.22 mg/L, and 0.27 mg/L, respectively. Figures 7, 8 and 9 show total phosphorus concentrations at the surface and bottom depths throughout the lake from 1996-1999. Total phosphorus concentrations tend to follow the same

FIGURE 5: CL-6

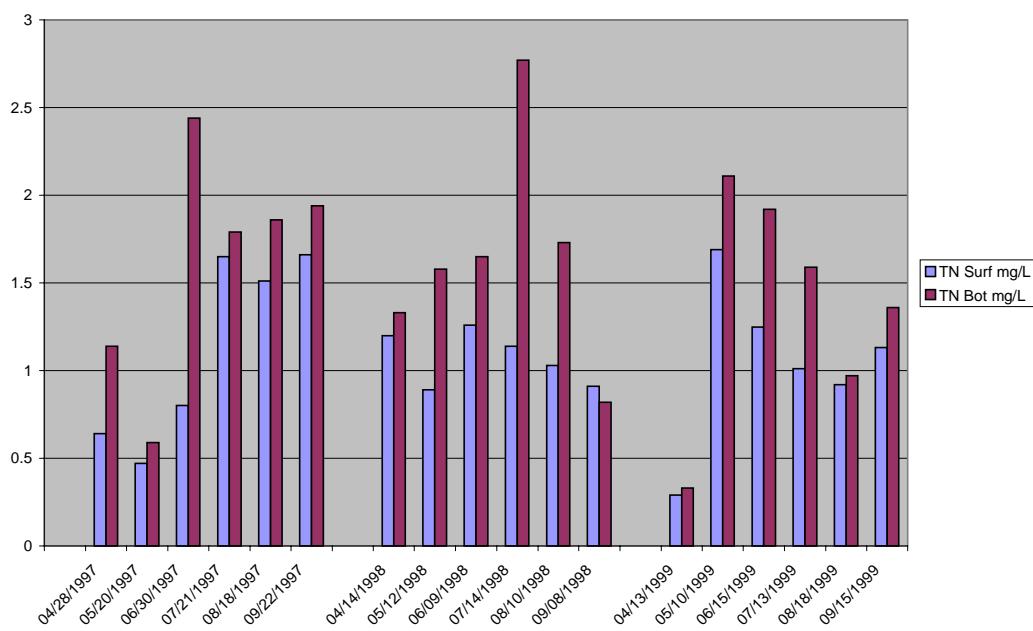
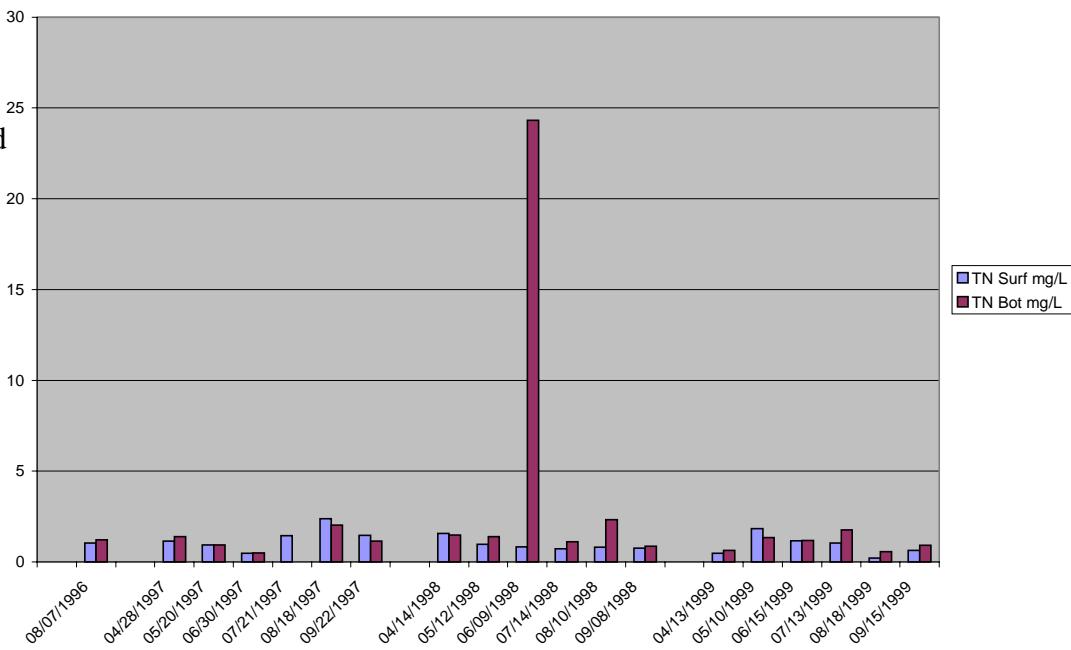


FIGURE 6: CL-12



pattern as the total nitrogen concentrations with spikes appearing during the same sampling periods. Again these can be attributed to high inflows and temperature differences between surface and bottom waters.

The 1999 total phosphorus

concentrations followed the long-term trend with 89% of the

concentrations equaling or exceeding the EPA generalized eutrophy criterion for lakes of 0.05 mg/L.

FIGURE 7: CL-2

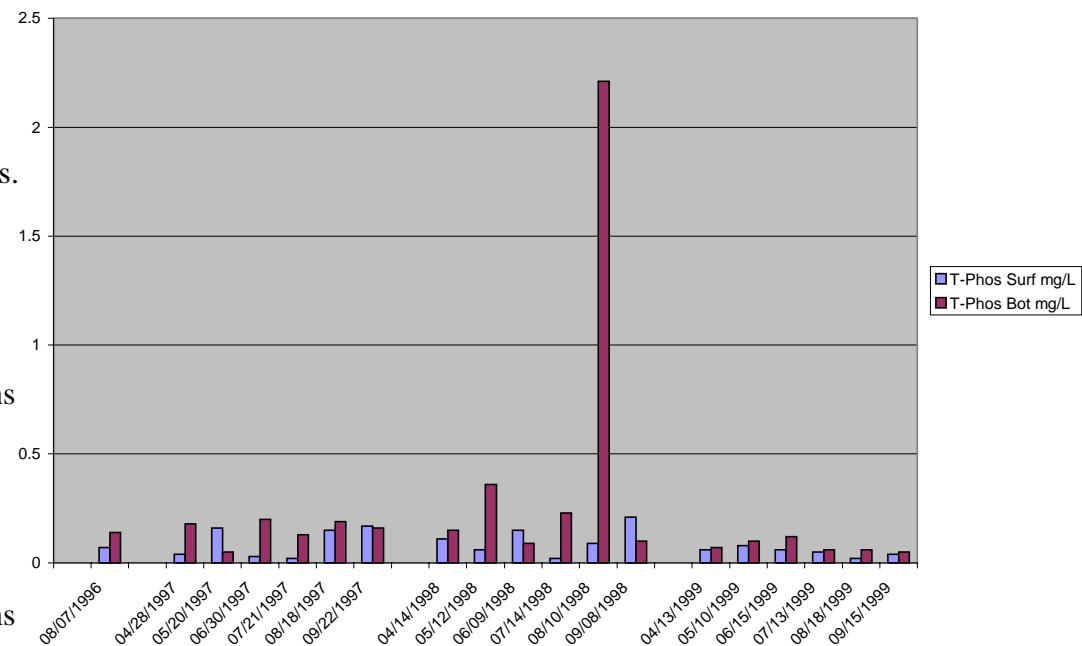


FIGURE 8: CL-6

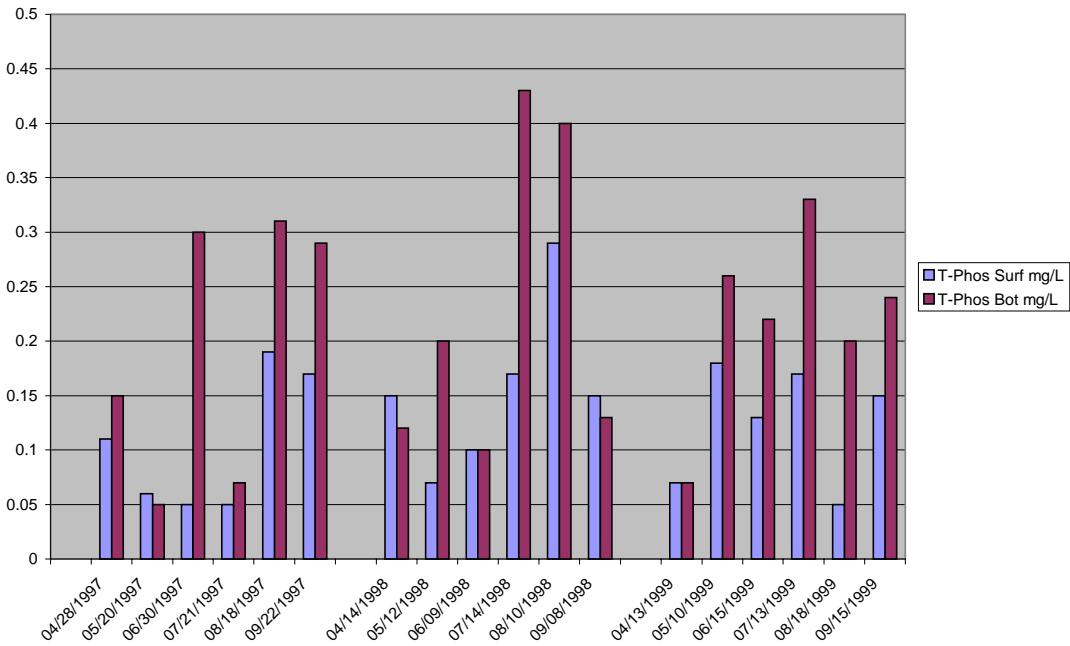
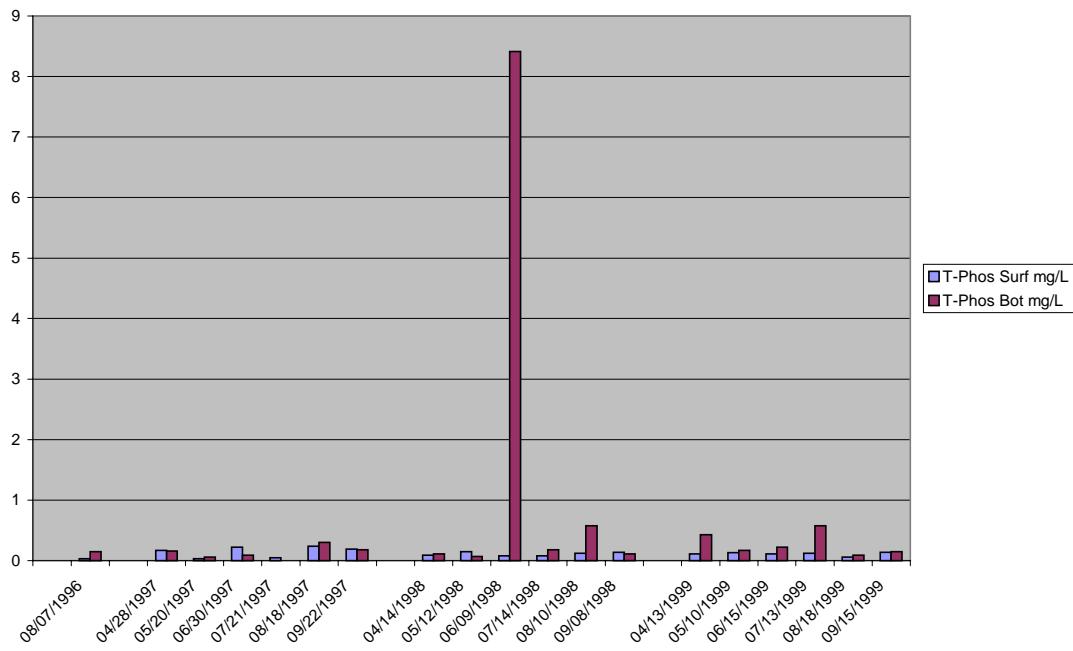


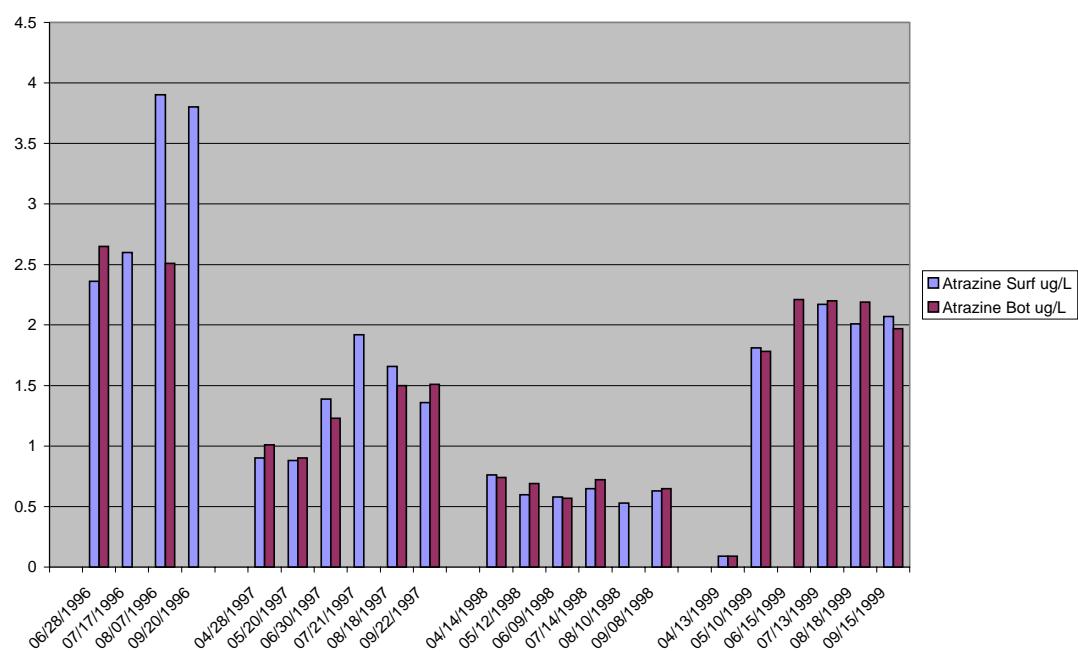
FIGURE 9: CL-12



In the monthly sampling, the four herbicides (atrazine, metolachlor, alachlor, and cyanazine) were detected at all three lake stations.

FIGURE 10: CL-2

Atrazine was detected in 94% of the samples. The mean and maximum atrazine



concentrations in the surface waters of the lake were as follows, 1.63 ug/L and 2.17 ug/L (CL-2);

2.04 ug/L and 3.2 ug/L (CL-6); and 1.92 ug/L and 2.92 ug/L (CL-12), respectively. Bottom mean and maximum atrazine concentrations for the above areas were 1.74 ug/L and 2.21 ug/L; 1.71 ug/L and 3.25 ug/L; and 1.95 ug/L and 3.06 ug/L, respectively.

Only the June samples at CL-6 and CL-12 exceeded the MCL of 3 ug/L for atrazine, however, 92% of the samples exceeded the EPA criterion for the protection of aquatic life (1 ug/L).

Figures 10, 11 and 12 show the trend for atrazine concentrations for the years 1996-1999. As can be seen from these graphs, high concentrations occur throughout the lake in early spring during high run-off periods and then level off. For the most part, concentrations are uniform throughout the water column. Although, alachlor, cyanazine, and metolachlor were

detected in the majority of the samples, the

FIGURE 11: CL-6

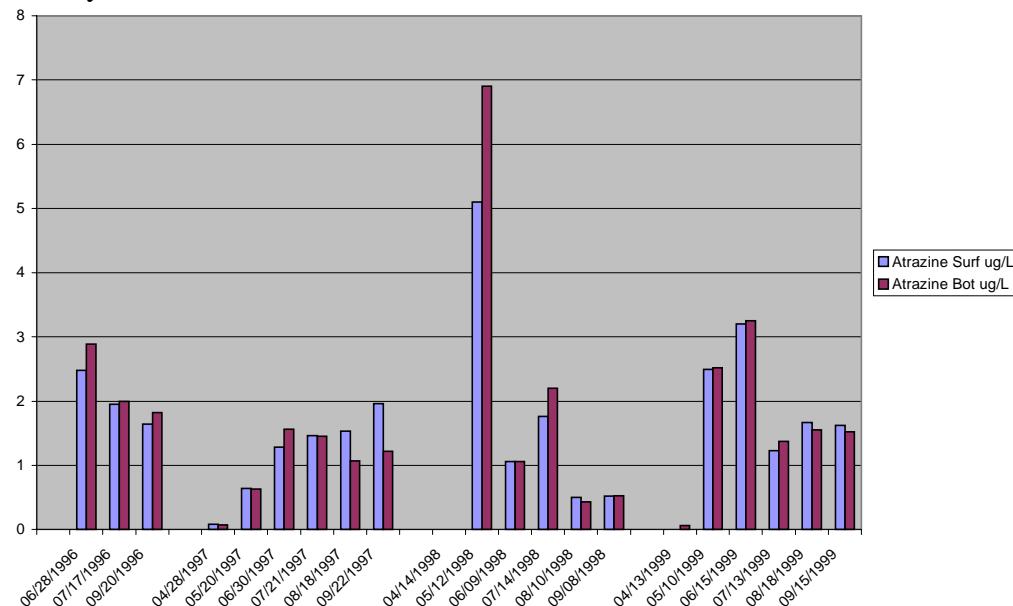
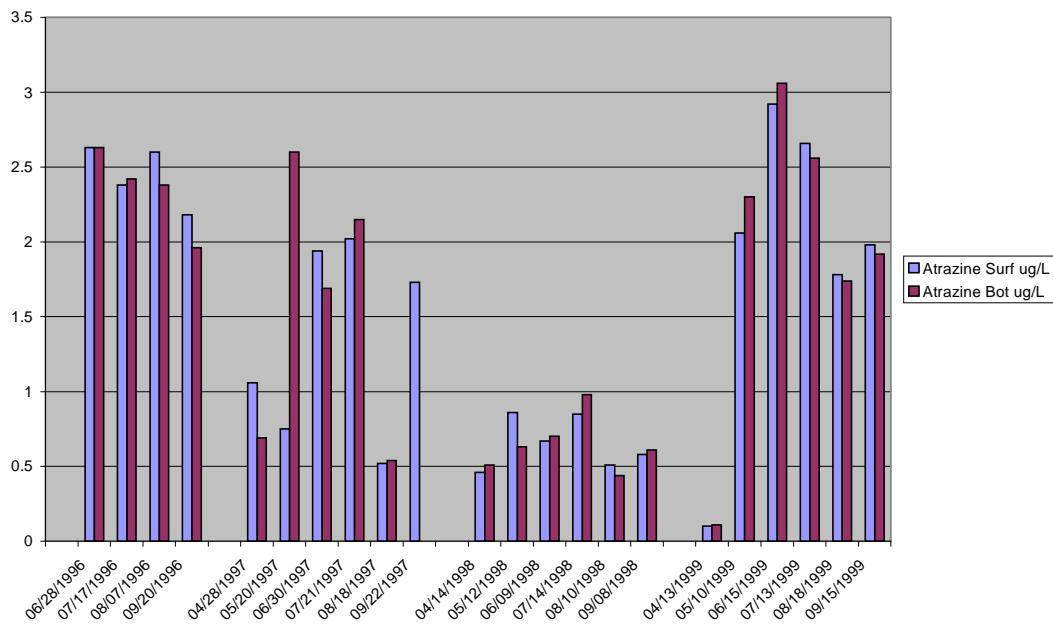


FIGURE 12: CL-12



concentrations were low and did not exceed any set standards.

c. **Outflow.** The present sampling indicated the water quality conditions in the outlet (CL-1) continue to be satisfactory. Mean TN and TP concentrations were 0.72 mg/L and 0.06 mg/L. Again as shown in figure 13 and 14,

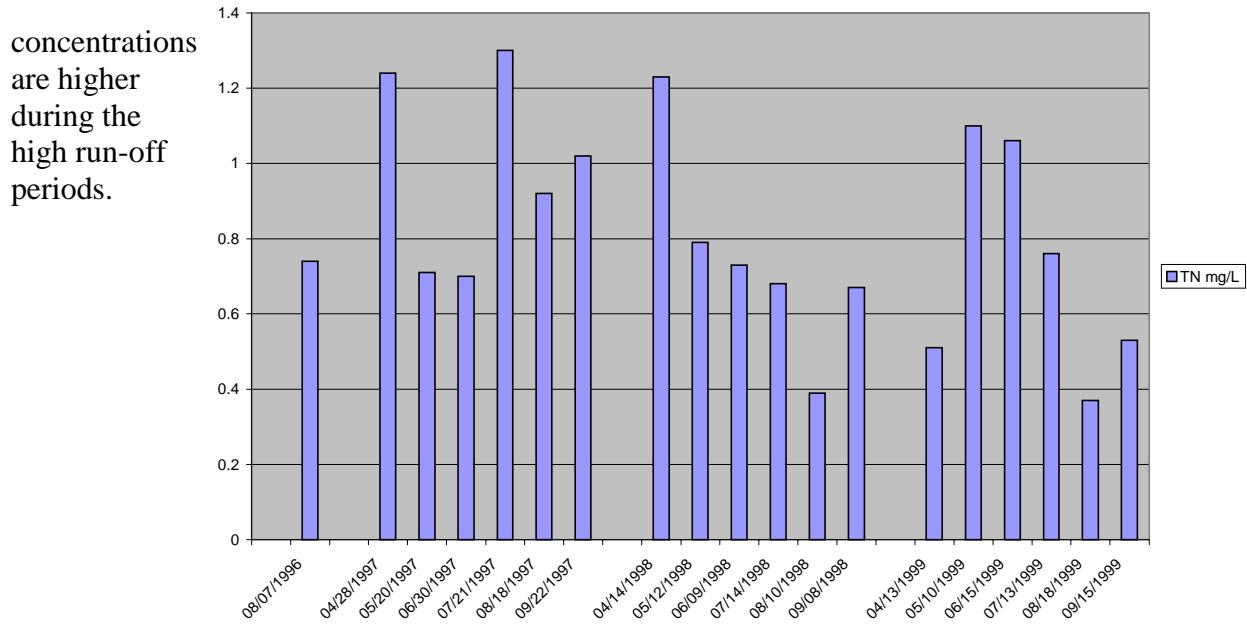
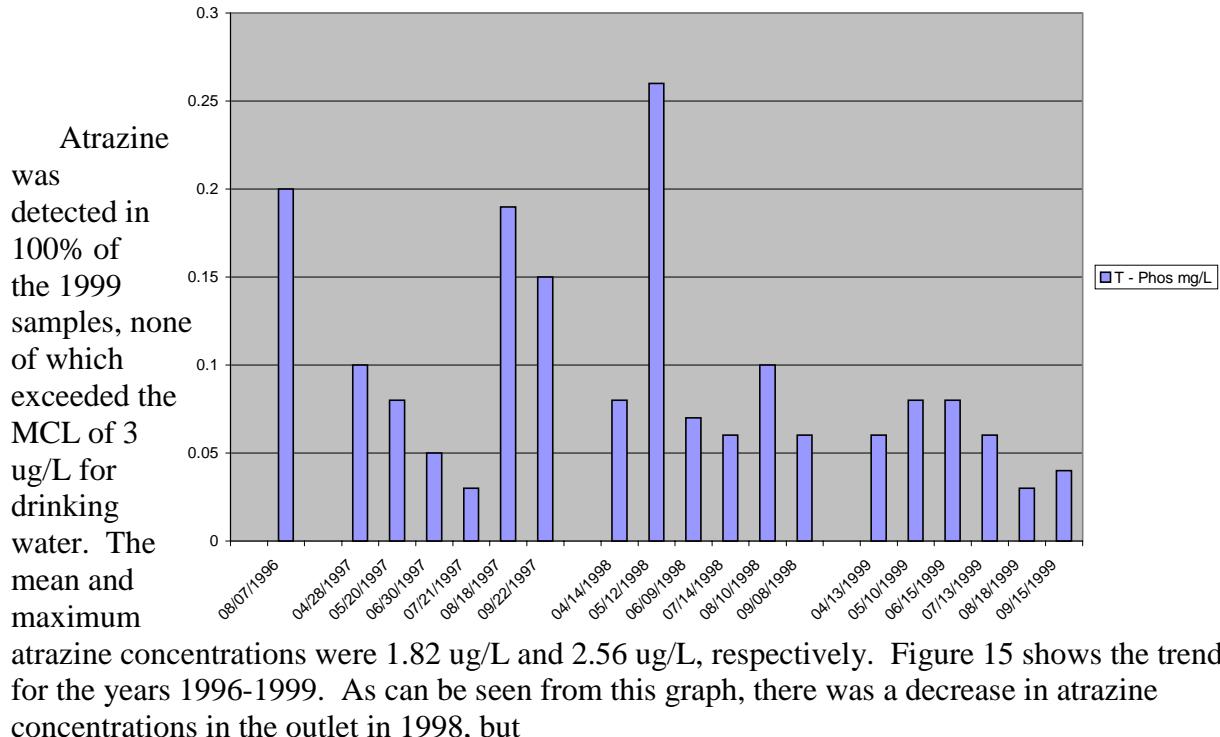


FIGURE 13: CL-1

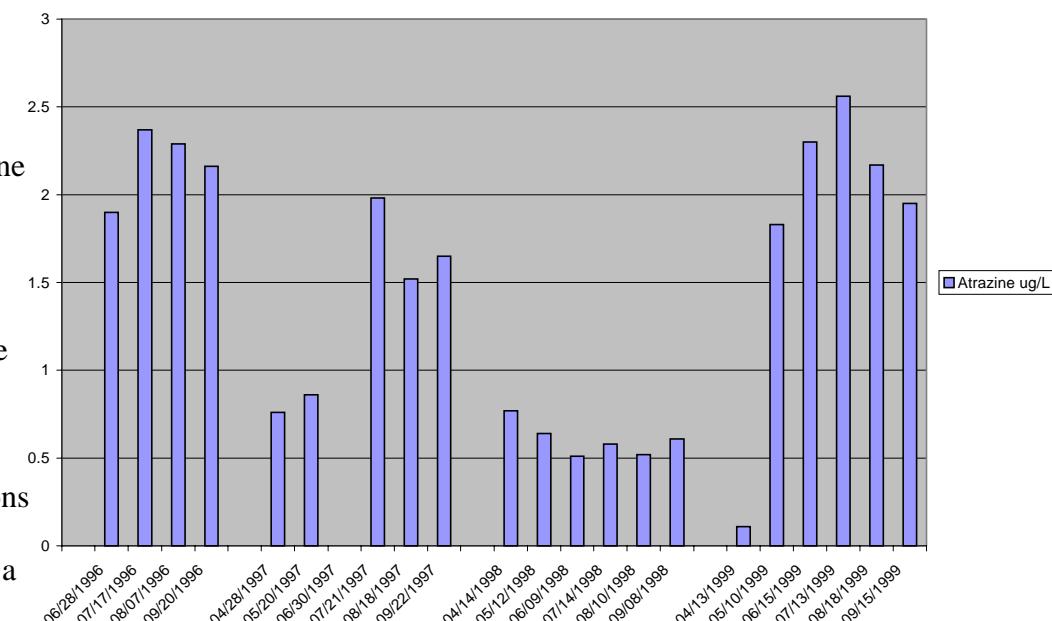


1999 are higher and parallel those of 1996 and 1997. Metolachlor was

detected in 100% of the samples, and alachlor and cyanazine were detected in 83% of the samples, however, the

concentrations were very low and not a real cause for concern.

FIGURE 15: CL-1



4. Future conditions.

The water quality of Clinton Lake continues to be good as evidenced by its excellent sport fishery of crappie, walleye, bass, bluegill, and catfish. The water quality parameters of most concern in the dimictic reservoir are turbidity, significant suspended solids loading, high nutrient and metal levels, and sharply reduced hypolimnetic oxygen concentrations in the summer. The greatest potential threat to water quality is pesticide loading derived from agricultural run-off from row crops within the watershed. Atrazine concentrations for the period of record show an almost continuous exceedence of the EPA criterion of 1 ug/L for the protection of aquatic life and exceedence of the 3 ug/L criterion for drinking water supplies during high run-off periods. Typically, downlake concentrations exceed 1.5 ug/L while uplake concentrations exceed 2 ug/L. These levels can be expected to remain as long as herbicide usage continues at its present levels. Since the uplake levels usually exceed the EPA MCL for drinking water during high run-off periods, any additional loading could also push downlake concentrations above the criterion and further impact water treatment plants located in the latter area. Past monitoring has shown that the pesticide levels pose a continuing threat to the finished drinking water for the project and recreation areas and to the rural water districts without the added treatment of activated carbon filtration. The latter treatment significantly reduces these pollutants in the finished water but increases water treatment costs.

5. Recommendations.

With the current staffing and funding levels, the water quality surveillance program for Clinton Lake will continue to be limited in 2000. Monthly nutrient and pesticide sampling

should continue to be conducted by Project personnel with logistical and analytical support from PM-PR-W. The District should enlist the other state and Federal agencies in developing a cooperative water quality monitoring and abatement program in 2001 for Clinton Lake and its watershed similar to the one currently underway for Hillsdale Lake and the Big Bull watershed

TABLE 1: CLINTON LAKE DATA 1996-1999

Station	Depth M	Date mm/dd/yy	Time hhmm	Atrazine ug/L	Alachlor ug/L	Metolachlor ug/L	Cyanazine ug/L	Ammonia mg/L	NO3/NO2 mg/L	TKN mg/L	TN mg/L	T - Phos mg/L	T - Ortho-P mg/L
CL - 16	0.1	06/28/1996	1400	2.29	0.61	0.44	0.06						
	0.1	07/17/1996	1215	2.53	0.64	0.57	0.08						
	0.1	08/07/1996	1430	2.23	0.48	0.18	0.08	<0.02	<0.01	0.6	0.6	0.05	0.01
	0.1	09/20/1996	1330	0.91	0.11	<0.05	<0.04						
Average				1.99	0.46	0.40	0.07			0.60	0.60	0.05	0.01
CL - 16	0.1	04/28/1997	1346	0.41	0.11	<0.05	<0.04	<0.02	0.26	0.8	1.06	0.1	0.02
	0.1	05/20/1997	1410	7.68	0.83	4.66	0.26	0.17	0.52	0.6	1.29	0.09	0.04
	0.1	06/30/1997	1630	4.6	<0.1	1	<0.1	<0.02	0.07	0.5	0.57	0.33	0.04
	0.1	07/21/1997	1315	1.15	0.62	0.4	0.04	0.03	0.02	1.7	1.75	0.16	0.02
	0.1	08/18/1997	1215	0.64	1.3	0.3	0.05	0.04	0.54	1.7	2.28	0.45	0.22
	0.1	09/22/1997	1050	0.59	0.19	0.05	0.07	0.06	0.06	1.3	1.42	0.21	0.04
Average				2.51	0.61	1.28	0.11	0.08	0.25	1.10	1.40	0.22	0.06
CL - 16	0.1	04/14/1998	1400	0.05	<0.05	0.06	<0.04	0.04	0.16	0.9	1.1	0.09	0.03
	0.1	05/12/1998	1408	0.32	0.11	0.2	<0.04	0.08	0.27	0.7	1.05	0.33	0.01
	0.1	06/09/1998	1235	7.1	2.3	1.33	0.17	0.79	0.45	0.9	2.14	0.11	0.04
	0.1	07/14/1998	1325	2.49	0.98	0.2	0.8	0.12	0.18	0.8	1.1	0.1	0.03
	0.1	08/10/1998	1440	0.24	0.22	0.08	<0.04	0.02	0.45	0.4	0.87	0.29	0.06
	0.1	09/08/1998	1255	0.15	0.08	<0.05	<0.04	0.09	0.16	0.5	0.75	0.07	0.05
Average				1.73	0.74	0.37	0.49	0.19	0.28	0.70	1.17	0.17	0.04
CL-16	0.1	04/13/1999	1024	1.87	0.87	0.69	0.14	0.17	0.62	3.85	4.64	1.77	0.03
	0.1	05/10/1999	1316	0.48	0.06	0.26	0.04	0.13	0.85	0.31	1.29	0.11	0.05
	0.1	06/15/1999	1330	4.34	2.52	1.63	0.12	U	1.13	0.66	1.79	0.15	0.07
	0.1	07/13/1999	1410	1.6	0.27	0.36	0.42	0.06	0.67	0.39	1.12	0.12	0.02
	0.1	08/18/1999	1123	0.43	0.16	0.06	0.05	0.06	0.29	0.13	0.48	0.04	0.01
	0.1	09/15/1999	1423	0.32	0.14	<0.05	<0.04	0.09	0.39	0.52	1	0.05	0.01
Average				1.51	0.67	0.60	0.15	0.10	0.66	0.98	1.72	0.37	0.03
CL - 1	0.1	06/28/1996	1500	1.9	<0.1	<0.1	0.1						
	0.1	07/17/1996	1305	2.37	0.35	1.03	0.09						
	0.1	08/07/1996	1340	2.29	0.17	0.61	0.14	0.04	0.1	0.6	0.74	0.2	0.02
	0.1	09/20/1996	1045	2.16	0.25	0.41	0.05						
Average				2.18	0.26	0.68	0.10	0.04	0.10	0.60	0.74	0.20	0.02
CL - 1	0.1	04/28/1997	1522	0.76	0.17	0.28	0.08	<0.02	0.24	1	1.24	0.1	0.02
	0.1	05/20/1997	1450	0.86	0.46	0.26	0.07	0.1	0.21	0.4	0.71	0.08	0.03
	0.1	06/30/1997	1805					0.07	0.13	0.5	0.7	0.05	0.02
	0.1	07/21/1997	1450	1.98	0.33	0.72	0.1	0.1	0.1	1.1	1.3	0.03	0.03
	0.1	08/18/1997	1550	1.52	0.25	0.37	0.09	0.1	0.02	0.8	0.92	0.19	0.02
	0.1	09/22/1997	1203	1.65	0.28	0.17	0.13	0.04	0.28	0.7	1.02	0.15	0.05
Average				1.35	0.30	0.36	0.09	0.08	0.16	0.75	0.98	0.10	0.03

Station	Depth M	Date mm/dd/yy	Time hhmm	Atrazine ug/L	Alachlor ug/L	Metolachlor ug/L	Cyanazine ug/L	Ammonia mg/L	NO3/NO2 mg/L	TKN mg/L	TN mg/L	T - Phos mg/L	T - Ortho-P mg/L
CL - 1	0.1	04/14/1998	1535	0.77	0.08	0.16	0.06	0.05	0.38	0.8	1.23	0.08	0.05
	0.1	05/12/1998	1507	0.64	0.15	0.14	0.05	0.05	0.14	0.6	0.79	0.26	0.01
	0.1	06/09/1998	1409	0.51	0.07	0.13	<0.04	0.09	0.14	0.5	0.73	0.07	0.04
	0.1	07/14/1998	1505	0.58	0.07	<0.05	0.07	0.14	0.04	0.5	0.68	0.06	0.03
	0.1	08/10/1998	1335	0.52	0.15	0.1	0.06	0.08	0.11	0.2	0.39	0.1	0.03
	0.1	09/08/1998	1458	0.61	0.08	0.14	0.05	0.17	0.2	0.3	0.67	0.06	0.02
Average				0.61	0.10	0.13	0.06	0.10	0.17	0.48	0.75	0.11	0.03
CL - 1	0.1	04/13/1999	1216	0.11	<0.05	0.11	<0.04	0.08	0.07	0.36	0.51	0.06	0.03
	0.1	05/10/1999	1610	1.83	0.22	1.09	0.09	0.16	0.48	0.46	1.1	0.08	0.07
	0.1	06/15/1999	1450	2.3	0.29	1.13	0.05	U	0.69	0.37	1.06	0.08	0.02
	0.1	07/13/1999	1537	2.56	0.38	1.23	0.44	0.15	0.38	0.23	0.76	0.06	0.01
	0.1	08/18/1999	1256	2.17	0.3	1.08	0.12	0.09	0.11	0.17	0.37	0.03	0.02
	0.1	09/15/1999	1557	1.95	0.33	1.07	0.12	0.04	0.12	0.37	0.53	0.04	U
Average				1.82	0.30	0.95	0.16	0.10	0.31	0.33	0.72	0.06	0.03
CL - 2	0.1	06/28/1996	1200	2.36	0.34	0.73	0.06						
	0.1	07/17/1996	0900	2.6	0.2	0.1	<0.1						
	0.1	08/07/1996	1000	3.9	<0.1	1	<0.1	<0.02	0.05	0.6	0.65	0.07	
	0.1	09/20/1996	1100	3.8	<0.1	0.7	<0.1						
Average				3.17	0.27	0.63	0.06		0.05	0.60	0.65	0.07	
CL - 2	0.1	04/28/1997	1022	0.9	<0.1	0.3	0.06	<0.02	0.24	0.9	1.14	0.04	0.02
	0.1	05/20/1997	1115	0.88	0.43	0.34	0.07	0.13	0.23	0.5	0.86	0.16	0.02
	0.1	06/30/1997	1308	1.39	0.2	0.54	0.08	0.02	0.08	0.2	0.3	0.03	0.03
	0.1	07/21/1997	1040	1.92	0.54	0.75	0.1	0.05	0.08	1.1	1.23	0.02	0.02
	0.1	08/18/1997	1350	1.66	0.24	0.41	0.09	0.04	0.02	0.8	0.86	0.15	0.03
	0.1	09/22/1997	1700	1.36	0.12	0.19	0.09	0.14	0.32	0.9	1.36	0.17	0.04
Average				1.35	0.31	0.42	0.08	0.08	0.16	0.73	0.96	0.10	0.03
CL - 2	0.1	04/14/1998	1225	0.76	0.06	0.15	0.06	0.05	0.37	0.9	1.32	0.11	0.05
	0.1	05/12/1998	1045	0.6	0.11	0.1	0.04	0.05	0.07	0.5	0.62	0.06	0.01
	0.1	06/09/1998	0930	0.58	0.11	0.18	0.06	0.1	0.16	0.4	0.66	0.15	0.03
	0.1	07/14/1998	1000	0.65	0.12	0.09	0.11	0.11	0.02	0.7	0.83	0.02	0.02
	0.1	08/10/1998	1050	0.53	0.12	0.11	0.06	0.08	0.04	0.6	0.72	0.09	0.02
	0.1	09/08/1998	1110	0.63	0.15	0.1	0.06	0.15	0.24	1.2	1.59	0.21	0.02
Average				0.63	0.11	0.12	0.07	0.09	0.15	0.72	0.96	0.11	0.03
CL - 2	0.1	04/13/1999	1150	0.09	<0.05	<0.05	<0.04	0.05	0.07	0.27	0.39	0.06	0.03
	0.1	05/10/1999	1040	1.81	0.21	1.07	0.11	0.13	0.49	0.32	0.94	0.08	0.07
	0.1	06/15/1999	0951					U	0.69	0.32	1.01	0.06	0.05
	0.1	07/13/1999	1155	2.17	0.35	1.27	0.42	0.09	0.39	0.26	0.74	0.05	0.01
	0.1	08/18/1999	1421	2.01	0.26	1.09	0.13	0.13	0.02	0.12	0.27	0.02	0.01
	0.1	09/15/1999	1018	2.07	0.32	0.98	0.12	0.03	0.11	0.38	0.52	0.04	U
Average				1.63	0.29	1.10	0.20	0.09	0.30	0.28	0.65	0.05	0.03

Station	Depth M	Date mm/dd/yy	Time hhmm	Atrazine ug/L	Alachlor ug/L	Metolachlor ug/L	Cyanazine ug/L	Ammonia mg/L	NO3/NO2 mg/L	TKN mg/L	TN mg/L	T - Phos mg/L	T - Ortho-P mg/L
CL - 2	15	06/28/1996	1200	2.65	0.38	1.01	0.07						
	15	07/17/1996											
	12	08/07/1996	1012	2.51	0.36	0.95	0.12	0.87	<0.01	1.5	2.37	0.14	0.04
	12	09/20/1996											
Average				2.58	0.37	0.98	0.10	0.87		1.50	2.37	0.14	0.04
CL - 2	12	04/28/1997	1034	1.01	0.24	0.26	0.17	<0.02	0.25	0.9	1.15	0.18	0.03
	12	05/20/1997	1127	0.9	0.42	0.24	0.07	0.15	0.23	0.5	0.88	0.05	0.03
	13	06/30/1997	1321	1.23	0.2	0.46	0.09	0.23	0.07	0.9	1.2	0.2	0.04
	12	07/21/1997	1052					0.3	0.04	1.6	1.94	0.13	0.07
	12	08/18/1997	1402	1.5	0.34	0.39	0.11	0.09	0.02	1.4	1.51	0.19	0.03
	12	09/22/1997	1712	1.51	0.17	0.18	0.11	<0.02	0.2	0.9	1.1	0.16	0.04
Average				1.23	0.27	0.31	0.11	0.19	0.14	1.03	1.30	0.15	0.04
CL - 2	12	04/14/1998	1237	0.74	0.06	0.15	0.06	0.05	0.33	0.9	1.28	0.15	0.05
	12	05/12/1998	1057	0.69	0.14	0.15	0.05	0.28	0.31	1.6	2.19	0.36	0.03
	12	06/09/1998	0942	0.57	0.06	0.15	0.04	0.09	0.13	0.5	0.72	0.09	0.03
	12	07/14/1998	1012	0.72	0.17	0.1	0.16	0.66	0.03	1.1	1.79	0.23	0.09
	13	08/10/1998	1103					0.7	0.12	5.1	5.92	2.21	0.05
	12	09/08/1998	1122	0.65	0.11	0.1	0.05	0.16	0.16	0.3	0.62	0.1	0.02
Average				0.67	0.11	0.13	0.07	0.32	0.18	1.58	2.09	0.52	0.05
CL - 2	12	04/13/1999	1202	0.09	< 0.05	< 0.05	< 0.04	0.05	0.07	0.25	0.37	0.07	0.03
	15.5	05/10/1999	1056	1.78	0.24	1.1	0.11	0.18	0.46	0.37	1.01	0.1	0.07
	12	06/15/1999	1003	2.21	0.27	1.06	0.06	0.02	0.73	0.5	1.25	0.12	0.07
	13	07/13/1999	1208	2.2	0.35	1.26	0.5	0.05	0.4	0.31	0.76	0.06	0.01
	12	08/18/1999	1433	2.19	0.29	1.1	0.13	0.32	0.13	0.2	0.65	0.06	0.04
	13	09/15/1999	1031	1.97	0.28	1.03	0.09	U	0.12	0.39	0.51	0.05	U
Average				1.74	0.29	1.11	0.18	0.12	0.32	0.34	0.76	0.08	0.04
CL - 6	0.1	06/28/1996	1330	2.48	0.3	0.76	0.07						
	0.1	07/17/1996	1140	1.95	0.19	0.72	0.07						
	0.1	09/20/1996	1130	1.64	0.2	0.36	<0.04						
Average				2.02	0.23	0.61	0.07						
CL - 6	0.1	04/28/1997	1305	0.08	0.06	0.08	<0.04	<0.02	0.14	0.5	0.64	0.11	0.02
	0.1	05/20/1997	1325	0.64	0.17	0.27	0.05	0.04	0.03	0.4	0.47	0.06	0.02
	0.1	06/30/1997	1700	1.28	0.24	1.02	0.16	0.02	0.08	0.7	0.8	0.05	0.04
	0.1	07/21/1997	1400	1.46	0.22	0.52	0.07	0.13	0.02	1.5	1.65	0.05	0.03
	0.1	08/18/1997	1500	1.53	0.3	0.08	0.09	0.09	0.02	1.4	1.51	0.19	0.03
	0.1	09/22/1997	1120	1.96	0.15	0.12	0.09	0.08	0.08	1.5	1.66	0.17	0.04
Average				1.16	0.19	0.35	0.09	0.07	0.06	1.00	1.12	0.11	0.03

Station	Depth M	Date mm/dd/yy	Time hhmm	Atrazine ug/L	Alachlor ug/L	Metolachlor ug/L	Cyanazine ug/L	Ammonia mg/L	NO3/NO2 mg/L	TKN mg/L	TN mg/L	T - Phos mg/L	T - Ortho-P mg/L
CL - 6	0.1	04/14/1998	1435	<0.05	<0.05	<0.05	<0.04	0.06	0.34	0.8	1.2	0.15	0.04
	0.1	05/12/1998	1322	5.1	0.18	2.43	0.17	0.08	0.01	0.8	0.89	0.07	0.01
	0.1	06/09/1998	1334	1.06	0.06	0.31	0.07	0.35	0.11	0.8	1.26	0.1	0.04
	0.1	07/14/1998	1440	1.76	0.21	0.74	0.2	0.12	0.02	1	1.14	0.17	0.03
	0.1	08/10/1998	1410	0.5	0.12	0.31	0.06	<0.02	0.03	1	1.03	0.29	0.04
	0.1	09/08/1998	1418	0.52	1.89	0.13	<0.04	0.18	0.13	0.6	0.91	0.15	0.04
Average				1.79	0.49	0.78	0.13	0.16	0.11	0.83	1.07	0.16	0.03
CL - 6	0.1	04/13/1999	1104	<0.05	<0.05	<0.05	<0.04	U	0.01	0.28	0.29	0.07	0.02
	0.1	05/10/1999	1425	2.49	0.1	1.84	0.13	0.26	0.7	0.73	1.69	0.18	0.07
	0.1	06/15/1999	1355	3.2	0.15	1.87	0.07	0.08	0.35	0.82	1.25	0.13	0.03
	0.1	07/13/1999	1454	1.23	0.24	0.74	0.27	0.08	0.04	0.89	1.01	0.17	0.02
	0.1	08/18/1999	1217	1.67	0.17	0.83	0.09	0.57	0.04	0.31	0.92	0.05	0.02
	0.1	09/15/1999	1521	1.62	0.18	0.47	0.1	U	U	1.13	1.13	0.15	0.01
Average				2.04	0.17	1.15	0.13	0.25	0.23	0.69	1.05	0.13	0.03
CL - 6	5	06/28/1996	1335	2.89	0.44	1.23	0.09						
	3.5	07/17/1996	1144	2	0.21	0.67	0.05						
	3	09/20/1996	1133	1.82	0.19	0.43	0.05						
Average				2.24	0.28	0.78	0.06						
CL - 6	5	04/28/1997	1310	0.07	<0.05	0.07	<0.04	0.27	0.17	0.7	1.14	0.15	0.02
	4	05/20/1997	1329	0.63	0.15	0.28	0.07	0.06	0.03	0.5	0.59	0.05	0.02
	3	06/30/1997	1703	1.56	0.25	1.23	0.11	0.43	0.11	1.9	2.44	0.3	0.05
	4	07/21/1997	1404	1.45	0.28	0.65	0.08	0.17	0.02	1.6	1.79	0.07	0.04
	3	08/18/1997	1503	1.07	0.16	0.24	0.07	0.4	0.06	1.4	1.86	0.31	0.05
	3	09/22/1997	1123	1.22	0.15	0.13	0.09	0.27	0.07	1.6	1.94	0.29	0.04
Average				1.00	0.20	0.43	0.08	0.27	0.08	1.28	1.63	0.20	0.04
CL - 6	3	04/14/1998	1438	<0.05	<0.05	0.25	<0.04	0.19	0.34	0.8	1.33	0.12	0.04
	3	05/12/1998	1325	6.9	0.2	2.79	0.19	0.44	0.04	1.1	1.58	0.2	0.01
	3	06/09/1998	1337	1.06	0.06	0.34	0.07	0.45	0.1	1.1	1.65	0.1	0.04
	3.5	07/14/1998	1444	2.2	0.15	0.79	0.15	0.74	0.03	2	2.77	0.43	0.08
	2.5	08/10/1998	1413	0.43	<0.05	0.3	<0.04	0.19	0.04	1.5	1.73	0.4	0.09
	3	09/08/1998	1421	0.53	0.09	0.12	0.05	0.2	0.12	0.5	0.82	0.13	0.04
Average				2.22	0.13	0.77	0.12	0.37	0.11	1.17	1.65	0.23	0.05
CL - 6	3	04/13/1999	1107	0.06	<0.05	<0.05	<0.04	U	0.03	0.3	0.33	0.07	0.02
	6.5	05/10/1999	1432	2.52	0.1	1.94	0.13	0.33	0.64	1.14	2.11	0.26	0.06
	3	06/15/1999	1358	3.25	0.18	1.64	0.08	0.27	0.35	1.3	1.92	0.22	0.05
	4	07/13/1999	1458	1.37	0.22	0.8	0.29	0.23	0.06	1.3	1.59	0.33	0.03
	3	08/18/1999	1220	1.55	0.2	0.85	0.11	0.32	0.12	0.53	0.97	0.2	0.04
	2.5	09/15/1999	1524	1.52	0.13	0.53	0.09	0.12	U	1.24	1.36	0.24	U
Average				1.71	0.17	1.15	0.14	0.25	0.24	0.97	1.38	0.22	0.04

Station	Depth M	Date mm/dd/yy	Time hhmm	Atrazine ug/L	Alachlor ug/L	Metolachlor ug/L	Cyanazine ug/L	Ammonia mg/L	NO3/NO2 mg/L	TKN mg/L	TN mg/L	T - Phos mg/L	T - Ortho-P mg/L
CL - 12	0.1	06/28/1996	0900	2.63	0.42	0.85	0.08						
	0.1	07/17/1996	1000	2.38	0.4	0.74	0.09						
	0.1	08/07/1996	1100	2.6	0.44	0.8	0.17	0.15	0.09	0.8	1.04	0.03	0.03
	0.1	09/20/1996	1200	2.18	0.27	0.48	0.08						
Average				2.45	0.38	0.72	0.11	0.15	0.09	0.80	1.04	0.03	0.03
CL - 12	0.1	04/28/1997	1052	1.06	0.45	0.39	0.08	0.03	0.52	0.6	1.15	0.17	0.03
	0.1	05/20/1997	1200	0.75	0.33	0.36	0.1	0.05	0.19	0.7	0.94	0.03	0.02
	0.1	06/30/1997	1445	1.94	0.41	0.96	0.07	<0.02	0.07	0.4	0.47	0.22	0.04
	0.1	07/21/1997	1145	2.02	0.57	0.69	0.1	0.12	0.02	1.3	1.44	0.05	0.04
	0.1	08/18/1997	1140	0.52	0.19	0.11	0.04	0.12	0.57	1.7	2.39	0.24	0.09
	0.1	09/22/1997	1610	1.73	0.35	0.18	0.11	0.1	0.06	1.3	1.46	0.19	0.03
Average				1.34	0.38	0.45	0.08	0.08	0.24	1.00	1.31	0.15	0.04
CL - 12	0.1	04/14/1998	1115	0.46	0.06	0.13	<0.04	0.09	0.39	1.1	1.58	0.09	0.04
	0.1	05/12/1998	1120	0.86	0.29	0.47	0.06	0.07	0.01	0.9	0.98	0.15	0.01
	0.1	06/09/1998	1010	0.67	0.15	0.18	0.05	0.07	0.06	0.7	0.83	0.08	0.04
	0.1	07/14/1998	1035	0.85	0.19	0.14	0.18	0.11	0.02	0.6	0.73	0.08	0.03
	0.1	08/10/1998	1145	0.51	0.21	0.14	0.05	<0.02	0.12	0.7	0.82	0.12	0.03
	0.1	09/08/1998	1030	0.58	0.11	0.09	0.05	0.09	0.17	0.5	0.76	0.14	0.06
Average				0.66	0.17	0.19	0.08	0.09	0.13	0.75	0.95	0.11	0.04
CL - 12	0.1	04/13/1999	1315	0.1	<0.05	<0.05	<0.04	U	U	0.47	0.47	0.11	0.03
	0.1	05/10/1999	0950	2.06	0.28	1.08	0.1	0.24	0.63	0.97	1.84	0.13	0.06
	0.1	06/15/1999	1040	2.92	0.53	1.54	0.09	U	0.62	0.54	1.16	0.11	0.06
	0.1	07/13/1999	1107	2.66	0.47	1.41	0.5	0.08	0.31	0.66	1.05	0.12	0.02
	0.1	08/18/1999	1507	1.78	0.3	1.02	0.11	0.08	U	0.13	0.21	0.06	0.02
	0.1	09/15/1999	1105	1.98	0.25	0.85	0.12	0.03	U	0.61	0.64	0.14	U
Average				1.92	0.37	1.18	0.18	0.11	0.52	0.56	0.90	0.11	0.04
CL - 12	6	06/28/1996	0906	2.63	0.6	0.93	0.09						
	8	07/17/1996	1008	2.42	0.43	0.83	0.17						
	7.5	08/07/1996	1108	2.38	0.28	0.5	0.12	0.24	0.08	0.9	1.22	0.15	0.04
	6	09/20/1996	1206	1.96	0.22	0.41	0.05						
Average				2.35	0.38	0.67	0.11	0.24	0.08	0.90	1.22	0.15	0.04
CL - 12	6	04/28/1997	1058	0.69	0.26	0.33	0.07	<0.02	0.5	0.9	1.4	0.16	0.05
	6	05/20/1997	1211	2.6	<0.01	0.2	<0.1	0.08	0.16	0.7	0.94	0.06	0.04
	4	06/30/1997	1449	1.69	0.38	0.88	0.11	0.02	0.07	0.4	0.49	0.09	0.04
	12	07/21/1997	1157	2.15	0.53	0.69	0.11				0		
	4	08/18/1997	1144	0.54	0.28	0.37	0.05	0.12	0.42	1.5	2.04	0.3	0.14
	4	09/22/1997	1614						0.09	0.06	1	1.15	0.18
Average								0.08	0.24	0.90	1.00	0.16	0.06

Station	Depth M	Date mm/dd/yy	Time hhmm	Atrazine ug/L	Alachlor ug/L	Metolachlor ug/L	Cyanazine ug/L	Ammonia mg/L	NO3/NO2 mg/L	TKN mg/L	TN mg/L	T - Phos mg/L	T - Ortho-P mg/L
CL - 12	6	04/14/1998	1121	0.51	0.08	0.18	0.05	0.1	0.39	1	1.49	0.11	0.03
	7	05/12/1998	1127	0.63	0.18	0.21	0.04	0.38	0.12	0.9	1.4	0.07	0.02
	6	06/09/1998	1016	0.7	0.15	0.24	0.05	0.19	0.14	24	24.33	8.41	0.04
	6.5	07/14/1998	1042	0.98	0.23	0.22	0.21	0.28	0.04	0.8	1.12	0.18	0.07
	6	08/10/1998	1151	0.44	0.29	0.15	0.05	0.21	0.22	1.9	2.33	0.58	0.04
	7	09/08/1998	1037	0.61	0.13	0.09	0.06	0.16	0.31	0.4	0.87	0.11	0.06
Average				0.65	0.18	0.18	0.08	0.22	0.20	4.83	5.26	1.58	0.04
CL - 12	6.5	04/13/1999	1322	0.11	< 0.05	< 0.05	< 0.04	0.05	0.01	0.57	0.63	0.43	0.06
	9.5	05/10/1999	1000	2.3	0.31	1.1	0.12	0.31	0.55	0.49	1.35	0.17	0.06
	7	06/15/1999	1047	3.06	0.57	1.49	0.08	U	0.59	0.59	1.18	0.22	0.07
	6	07/13/1999	1113	2.56	0.5	1.31	0.53	0.14	0.23	1.4	1.77	0.58	0.03
	5.5	08/18/1999	1513	1.74	0.31	0.94	0.11	0.24	0.04	0.29	0.57	0.09	0.06
	7	09/15/1999	1112	1.92	0.3	0.75	0.05	0.02	U	0.89	0.91	0.15	0.01
Average				1.95	0.40	1.12	0.18	0.15	0.28	0.71	1.07	0.27	0.05